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Survey, incidence and field study of *Purpureocillium* sp. in different crops

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Abstract

Survey was carried out to identify occurrence and prevalence of *Purpureocillium* sp. from tomato, chilli, brinjal and okra crops in districts of South Gujarat viz., Navsari, Valsad and Tapi. The specific objectives were to isolate and identify native *Purpureocillium* sp. strains from the rhizospheres of solanaceous crops. A random survey was conducted in the major tomato, chilli, brinjal and okra growing areas of South Gujarat and it was revealed that the occurrence and prevalence of *Purpureocillium* sp. was maximum in Tapi district. Total four *Purpureocillium* sp. strains were isolated from solanaceous crop rhizospheres in Navsari, Valsad and Tapi districts of South Gujarat. Two strains (i.e., Siker and Ambach) were isolated from Tapi district and one each from Navsari district (i.e., Abrama) and Valsad district (i.e., Baroliya). The Root knot nematode intensity was observed among the entire district surveyed. Symptoms observed were yellowing, stunting on above ground parts of plant and root galls on below ground parts of the plant.

Keywords: *Purpureocillium*, Occurrence, Survey, Crops

Introduction

Plants are an incredibly important kingdom of organisms having amazing ability to make their own food from carbon dioxide in the atmosphere and with the help of chlorophyll content. They provide the foundation of many food webs and also animal life would not exist if plants were not around. However, the potentiality of plant to function normally and to produce food for mankind and others has been disrupted by the attack of different pathogens which causes disease.

A plant disease is usually defined as abnormal growth or disfunction of a plant. Diseases are the result of some disturbance in the normal life process of the plant. In other words, any malfunctioning of host cells and tissues that results from continuous irritation by a pathogenic agent or environmental factors that leads the development of the symptoms.

Disease may be result of the any living or non-living causes. Biotic diseases are caused by the living organisms like fungi, bacteria, viruses, nematodes and phytoplasma like organisms. Abiotic diseases are caused by non-living environmental conditions such as soil compaction, wind, frost, nutritional abnormalities, mineral toxicity and pesticide exposure etc.

Purpureocillium sp. is a common saprophytic, filamentous fungus. It has been isolated from a wide range of habitats including cultivated and uncultivated soils from forests, grassland, deserts, estuarine sediments and sewage sludge. It has been found in nematode eggs and occasionally from females of root knot and cyst nematodes. In addition, it has been frequently detected in the rhizospheres of many crops. These species can grow at a wide range of temperatures from 8°C to 30°C with optimal growth in the range of 20° to 25°C. It has a wide pH tolerance and can grow on a variety of substrates (Paladiya *et al.*, 2026). *Purpureocillium* sp. has shown promising results as a biocontrol agent to control the growth of destructive root knot nematodes and other soil-borne pathogens (Anusha, 2014).

Looking into the severity of root knot nematodes and other soil borne pathogens infestation on various crops and farmers inclination towards the biocontrol agents for the management of these diseases. Thus, the present study has been taken up with the specific objectives.

Materials and Methods

An intensive survey was carried out to know the appearance of *Purpureocillium* sp. in different solanaceous crops viz., Tomato, Chilli, Brinjal and Okra in growing areas of Navsari, Valsad and Tapi districts of South Gujarat. Samples of collected soil were analyzed. For this purpose two talukas in each district were taken and in each taluka, two villages were taken for the assessment of the disease. The soil samples were collected by using random sampling method from the disease as well as healthy crop rhizospheres and methodology was followed as suggested by Pau *et al.*, 2012.

Soil samples were collected from the rhizosphere of diseased infected plant at the depth of 12 to 15cm. Each sample was taken separately in polythene bags and tied with a rubber band and labelled immediately. Information pertaining to the locality, GPRS location and stage of the crop was recorded.

Root knot index was calculated by following the grade suggested by Taylor and Sasser (1978) as given below:

Grade	Description
0	No gall or egg mass per plant
1	1 to 2 gall or egg mass per plant
2	3 to 10 gall or egg mass per plant
3	11 to 30 gall or egg mass per plant
4	31 to 100 gall or egg mass per plant
5	More than 100 gall or egg mass per plant

For the assessment of the Nematode gall index, randomly 5 locations in each field and total 100 plants were selected.

Result and Discussion

Roving survey was carried out during the year 2019-20 to assess the presence of nematophagous fungi *Purpureocillium* sp. and observation recorded on incidence of root knot nematode in major crops viz., tomato, chilli, brinjal and okra growing districts of Navsari, Valsad and Tapi of South Gujarat. Incidence of root knot nematode was calculated by using nematode gall index as suggested by Taylor and Sasser (1978). Among all the districts surveyed of South Gujarat the *Purpureocillium* sp. was more prevalent in Tapi district. Various locations had different soil and climatic conditions and crops were at different growth stages during the field visit. The different crops were

surveyed for prevalence of *Purpureocillium* sp. and occurrence of root knot nematode.

In Navsari district, survey was carried out in four locations which had medium to black soil type and crops like tomato, chilli and brinjal were in flowering to fruiting stage. However, *Purpureocillium* sp. was found only in Abrama village of Jalalpor taluka. The respective sample was collected and coded as P-1, which had root knot incident. Mandir, Sadakpor and Soldhara areas are other locations where, the root knot nematode was not noticed. *Purpureocillium* sp. was isolated only from Abrama location and it was called as Abrama isolate (P-1).

In Valsad district, total four locations were surveyed, among them *Purpureocillium* sp. was found only at Baroliya village of Dharampur taluka. The isolate was collected and coded as P-2. In this location, the soil was black and brinjal crop was in flowering to fruiting stage. Root knot nematode incidence was observed at Baroliya village only of Dharampur taluka. However in other locations viz., Banti, Ozarda and Panas root knot nematode incidence was not observed. *Purpureocillium* sp. was isolated only from Baroliya location and it was called as Baroliya isolate (P-2). In Tapi district, out of four locations surveyed *Purpureocillium* sp. was found in two locations namely Siker and Ambach village of Valod taluka and it was coded as P-3 and P-4 respectively. The soil was medium to black soil type and okra and tomato crops were in flowering to fruiting stages. Root knot nematode incidence was observed only in Ambach location. In other villages viz., Siker, Borkhadi and Balpur root knot nematode incidence was not observed. The *Purpureocillium* sp. was isolated from two locations in Tapi district and they were called as Siker (P-3) and Ambach (P-4) isolates. Overall the survey results indicate that Siker and Ambach are the two locations of Tapi district, which can be considered as the main spot region for the presence of *Purpureocillium* sp. However, least presence of *Purpureocillium* sp. was found in Abrama village of Jalalpor taluka of Navsari district and Baroliya village of Dharampur taluka of Valsad district from which bioagents were isolated (Table 1 and Plate 1). Similar research findings were made by Anusha *et al.* (2017) while, working on the solanaceous fruit crops like tomato, okra, chilli and brinjal. They isolated seven different strains of *P. lilacinus* from different districts of Northern Karnataka.

Table 1: Survey for the presence of *Purpureocillium* sp. in different crops of South Gujarat during the year 2019-20

District	Taluka	Village/ Location	Type of soil	Crop	Stage of crop	Gall index*	Presence / Absence of <i>Purpureocillium</i> sp.
Navsari	Jalalpor	Abrama 20.94'86" °N 72.89'73" °E	Medium Black	Tomato	Flowering	1	+
		Mandir 20.94'97" °N 72.90'57" °E	Black	Chilli	Fruiting	-	-
	Chikhli	Sadakpor 20.73'37" °N 73.05'30" °E	Medium Black	Chilli	Fruiting	-	-
		Soldhara 20.75'79" °N 73.06'31" °E	Medium Black	Brinjal	Fruiting	-	-
Valsad	Dharampur	Banti 20.54'39" °N 73.16'17" °E	Black	Chilli	Fruiting	-	-
		Baroliya 20.53'82" °N	Black	Brinjal	Fruiting	1	+

	Kaprada	73.17'47" °E Ozarda 20.34'41" °N 73.21'82" °E	Black	Tomato	Flowering	-	-
		Panas 20.34'41" °N 73.21'82" °E	Black	Okra	Fruiting	-	-
Tapi	Vyara	Borkhadi 20.82'31" °N 73.27'59" °E	Medium Black	Brinjal	Fruiting	-	-
		Balpur 21.11'02" °N 73.39'69" °E	Medium Black	Tomato	Flowering	-	-
	Valod	Siker 21.22'10" °N 72.77'76" °E	Black	Okra	Fruiting	-	+
		Ambach 21.01'64" °N 73.30'23" °E	Black	Tomato	Fruiting	2	+

+ Presence of *Purpureocillium* sp.– Absence of *Purpureocillium* sp. *1 & 2 Nematode Gall Index



Plate 1: Survey and collection of soil samples from the healthy as well as infected rhizospheres of different crops.

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